CORRECTIVE ACTON REPORT

MELVIN YARBOROUGH PROPERTY
2205 OAK HILL DRIVE
GREENSBORO, NORTH CAROLINA

OCTOBER 16, 1995

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LEGACY ENVIRONMENTAL SERVICES, INC.

CORRECTIVE ACTION PLAN

MELVIN YARBOROUGH PROPERTY
2205 OAK HILL DRIVE
GREENSBORO, NORTH CAROLINA

OCTOBER 16, 1995

PREPARED BY:

LEGACY ENVIRONMENTAL SERVICES, INC.
P.O. BOX 4560
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R95-198

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*Obtained from EPA Publication EPA 510-F-93-030

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Corrective Action Plan Report
Melvin Yarborough Property
2205 Oak Hill Drive
Greensboro, North Carolina

1.0 INTRODUCTION

1.1 Site Information

Site Location and Usage: Melvin Yarborough owns a lot containing one occupied structure used for residence at 2205 Oak Hill Drive in Greensboro, North Carolina. Figure 1 illustrates the location of this facility on the U.S.G.S. Greensboro, N.C. topographic quadrangle, and Figure 2 illustrates the project location in relation to adjacent properties. The adjacent surrounding area is used primarily for residential purposes.

Property Owner: Melvin Yarborough
2205 Oak Hill Drive
Greensboro, North Carolina

Responsible Party: same as above

Groundwater Incident (GWI) Number: 10017

1.2 Source Information

Release Source: (1) 550-gallon non-commercial heating oil UST used for heating of the residence.

On-site Source Type: Low boiling point hydrocarbons according to Method 5030 Total Petroleum Hydrocarbons (TPH) and high boiling point hydrocarbons according to 3550 TPH

1.3 Contamination Assessment

Soil: Approximately 250 tons of petroleum impacted soils above final clean-up levels of 10 and 40 parts per million (ppm according to Methods 5030 and 3550 TPH respectively) were identified in our investigation. Contaminants consist of 3550 TPH at a maximum level of 1,450 ppm and 5030 TPH at a maximum level of 145 ppm. Table 1 summarizes soil sample field and laboratory analytical results.

Groundwater: Several compounds were detected in groundwater samples collected from the monitoring well MW-1 installed in the former tank location at the site. Total xylenes, naphthalene, and seven tentatively identified compounds were detected in well MW-1. Total xylenes were detected at a level of 17 micrograms per liter (ug/l), and Naphthalene was found at a level of 15 (ug/l). The tentatively identified compounds in MW-1 were reported at a total level of 193 ug/l. No 2L violations for organic compounds were noted in any other monitor wells installed at the site, including MW-5 which was placed slightly downgradient of the tank pit. Lead was detected in two of the wells with the highest concentration being 45 ug/l in MW-3.

1.4 Aquifer Testing

One single well falling head test or "slug test" was performed on MW-4 to determine the saturated hydraulic conductivity of the water table aquifer. MW-4 was selected since it is the only on-site well in which the screened interval is totally located beneath water table. The method of Bouwer and Rice (Bouwer and Rice, 1989, 1976) was chosen to reduce the slug test data. A computer program developed by the Geraghty & Miller Modeling Group named AQTESOLV was used to estimate the aquifer parameters. Results of the slug test indicate a hydraulic conductivity in the tested well of 2.57×10^{-4} feet/minute. This result is consistent with published values for silt, loess and silty sand (Freeze & Cherry, 1979). Slug test data are included in Appendix A.

Ground water flow velocity was determined by averaging the hydraulic conductivity values and assuming an estimated effective porosity of 20% for soils at the site. The following equation yields an estimate of average ground water flow velocity:

$$v = k/n \times dh/dl$$

Where
v=average ground water flow velocity
K=average hydraulic conductivity=2.57×10^{-4}ft/min.
n=effective porosity=0.20
dh/dl=ground water head gradient=0.039 ft/ft

Average ground water flow velocity at the site is calculated to be 5.01×10^{-5}feet/minute (26.34 feet/year).

1.5 Initial Remedial Actions to Date

No remedial actions have been initiated to date at the site. The non-regulated 550 gallon heating oil UST was removed on February 24, 1993. Soils removed during the tank removal were placed back into the excavation pending analytical results and evaluation of remedial alternatives.

1.6 Regulatory Requirements

Applicable Regulations:

1) Oil Pollution and Hazardous Substances Control Act, North Carolina General Statutes 143-215.75;

2) Groundwater Classifications and Standards, Title 15A, North Carolina Administrative Code (NCAC), Subchapter 2L; and

3) Criteria and Standards Applicable to Underground Storage Tanks, NCAC, Title 15A, Chapter 2, Subchapter 2N.

Groundwater Classification: Class GA

Current Maximum Groundwater Contaminant Concentrations:

Constituent	Max. Conc.	2L STD
Total Xylenes	17 ug/l	530
Naphthalene	15 ug/l	21
Lead	45 ug/l	15
Total TICs	193 ug/l	NSE*

* No Standard Established for Tentatively Identified Compounds (TICs)

1.7 Previous Reports

1) *UST Closure Report*, Catlin & Associates, Inc., March 24, 1993;

2) *Initial Site Characterization Report*, Legacy Environmental Services, Inc., May 4, 1994;

3) *Comprehensive Site Assessment Report*, Legacy Environmental Services, Inc., March 10, 1995.

2.0 OBJECTIVES OF THE CORRECTIVE ACTION PLAN

2.1 Goals and Expected Accomplishments

The goal of the Corrective Action Plan (CAP) is to eliminate the petroleum hydrocarbon impacted soils at the site. To date, impact on the groundwater in the vicinity of the release has been extremely minimal. No 2L violations exists for target compounds associated with fuel oil. Therefore, by the expedient removal and treatment of the impacted soils, the risk of further impact to the groundwater will be reduced. To accomplish this goal, the CAP will focus on soil treatment.

2.2 Target Cleanup Concentrations for Soil

The target cleanup concentrations for soil at the subject facility are dictated by guidelines and regulations enforced by the NCDEM. Soils located within the impacted area should be remediated to 40 ppm for 3550 TPH compounds and to 10 ppm for 5030 compounds since contaminated soils have been identified within 5' of the seasonal high water table. Contaminants consist of 3550 TPH at a maximum level of 1,450 ppm and 3550 TPH at a maximum level of 145 ppm. Legacy's depth to groundwater data indicates that groundwater varies with depths ranging from approximately 9 feet to 21 feet below ground surface at the site during wet and dry seasons.

2.3 Target Cleanup Concentrations for Groundwater

The target cleanup concentrations for dissolved petroleum constituents in groundwater are dictated by guidelines and regulations enforced by the NCDEM as specified in 15A NCAC 2L (2L Standard). The compounds detected in groundwater monitoring well MW-1, Total Xylenes and Naphthalene, have current 2L Standard listings of 530 ppb and 21 ppb respectively. No 2L violations were determined for these compounds. The Tentatively Identified Compounds (TICs) found in MW-1 have a total concentration of 193 ppb and currently have no 2L Standard. Lead was also found in MW-3 and MW-4 with the highest concentration being 45 ppb in MW-3. The current 2L Standard for lead is 15 ppb.

2.4 Evaluation of Alternate Standards & Natural Processes

The suitability of the CAP approval without requiring groundwater remediation to standards according to 2L .0106 (K) were evaluated for the project site. Alternate standards do not have to be considered for this site if the actions recommended in this CAP are executed since:

- No free product is known to exist at the site. Excavation and removal of petroleum impacted soils would remove the source of further contamination to groundwater.

- The direction of groundwater migration is towards the east/southeast. Monitoring well MW-5 is situated in the downgradient direction and could be utilized to detect any concentrations of detected contaminants that may migrate by advective transport from the source area at MW-1.

- With the exception of TICs and lead, no 2L violations exist for target organic compounds.

- The detected compounds are not expected to intercept surface waters which are located approximately 1,500 feet to the east.

2.5 Target Start-up and Completion Dates

The target Start-up and completion dates are summarized as follows:

Item	Completion Date
Initiation of soil removal and remedial action:	Within one month of CAP approval
Project Completion Date	Within two weeks of initiation

The proposed Start-up dates are achievable assuming the following: 1) timely approval of the CAP. 2) funds are available to pay for professional services and expenses incurred. 3) there is little or no interference with the proposed remediation activities to be initiated at the site.

3.0 EXPOSURE ASSESSMENT

3.1 Historical Analytical Data

Samples collected at the Melvin Yarborough property have revealed the presence of petroleum constituents in soil and, to a minor extent, groundwater. Table 1 summarizes laboratory and field analytical results for soil samples collected at the site. Laboratory reports for the data summarized in Table 1 are included in the Comprehensive Site Assessment (CSA) prepared for this site. Figures 4 and 4A illustrate the approximate horizontal distribution of petroleum impacted soils according to Methods 5030 and 3550 respectively. These figures illustrate the estimated extent of Method 5030 and 3550 TPH according to WSRO recommended clean-up levels (10 ppm-5030;40 ppm-3550). Figure 5 illustrates the soil sample locations and results according to Methods 5030 and 3550 in cross-section. Figure 6 and 6A depict the estimated potentiometric surface and groundwater flow direction at the site as measured 12-13-94 and 2-17-95 respectively.

3.2 Physical and Chemical Characteristics of Contaminants

Contaminants discovered at the Melvin Yarborough property were confirmed by laboratory analyses to be low boiling point TPH according to Method 5030 and high boiling point TPH according to Method 3550 which is sorbed onto soil particles in the vicinity of the former UST location. Xylenes (17 ug/l), naphthalene (15 ug/l), lead (45 ug/l), and seven TICs (a total of 193 ug/l), detected in groundwater samples collected from the monitor wells were the only other compounds detected.

3.3 Potential Human Exposure Pathways

The Melvin Yarborough property is located in an area which is primarily of residential use. The release area is situated on a moderately eastward sloping lot with an average elevation of 890 feet above mean sea level. The nearest surface water point is a unnamed tributary of Buffalo Lake located approximately 1,500 feet to the east of the site.

No water supply wells were revealed during site reconnaissance within a 1,500 foot radius of the site. The surrounding properties utilize municipal water supplied by the City of Greensboro. No underground utilities or structures were noted in vicinity of the release area.

3.4 Potential Effects of Residual Contamination

3.4.1 Soil

Remnant petroleum hydrocarbons in soils near the former USTs at the Melvin Yarborough property following remediation to will be at such levels that natural attenuation and dispersion processes should adequately protect nearby surface waters. Local groundwater is not used for consumptive purposes.

3.4.2 Ground and Surface Waters

Based on laboratory analytical data from the perimeter monitoring wells, the detected compounds appear limited to the immediate area of monitor well MW-1.

4.0 EVALUATION OF REMEDIAL ALTERNATIVES

4.1 Available Remedial Options - Groundwater

Due to the presence of only Xylenes at 17 ug/l, naphthalene at 15 ug/l, and total TICs at 193 ug/l and the limited extent based on laboratory analyses, groundwater remediation is not recommended at the site. It is believed that source removal (soil excavation) will adequately protect the groundwater at the site.

4.2 Available Remedial Options - Soil

Options which have been considered for remediation of soil at the Melvin Yarborough site have been limited to ex-situ methodologies in effort to limit the possible impact to groundwater that may result if the soils are left in place during remediation and also due to space constraints. The options evaluated include: 1) Ex situ bioremediation: Land farming; 2) Excavation and Off-Site Treatment; and 3) Ex-situ bioremediation: Biomounding. Tables 2A, 2B, & 2C are excerpts from EPA Publication EPA 510-F-93-029 which summarizes the relative advantages and disadvantages of the various options which have been considered. The following is a brief discussion of each technology:

4.2a Ex-Situ Bioremediation: Land Farming

Ex-situ bioremediation, land farming or land treatment, is a technique for removing biodegradable contaminants from excavated soil. The excavated soil and added nutrients are spread over a lined treatment area. The area is periodically tilled to facilitate the natural release of volatile organic compounds (VOCs) and the biodegradation of contaminants.

Land farming is effective on many soil types and a variety of contaminants. It is also easy and inexpensive to design, operate, and maintain.

4.2b Excavation and Off-Site Treatment

Excavation and off-site treatment is a method for removing contaminants from small volumes (<1,000 cubic yards) of soil that cannot be treated effectively on site. Numerous treatment facilities are permitted in North Carolina which remediate contaminated soils via landfarming, thermal desorption, brickmaking, and bio-remediation.

This remediation technique can be used with almost any type of petroleum contamination and soil type. Implementation of this technique requires no permitting or design of remediation systems.

4.2c Ex-Situ Bioremediation: Biomounding

Ex-situ bioremediation (biomounding) is a technique for removing biodegradable contaminants form excavated mounds of soil. Nutrients are added to the soil mounds, which are often several feet high, to facilitate bioremediation, aeration conduits and irrigation systems are constructed in the mound. Biomounding is appropriate for shallow contamination sites that cover a large horizontal area. This is a low maintenance technique that requires a relatively short treatment time. Biomounding also provides better control over aeration, moisture, nutrient levels, and soil texture than other methods.

4.3 Recommended Remedial Option

Based on the apparently limited extent of petroleum affected soil, contaminant concentrations, low cost associated with disposal, and the physical constraints of the project site, excavation and off-site treatment is recommended.

5.0 PROPOSED CORRECTIVE ACTION PLAN

The cost for remediation of the site via excavation and ex-situ remediation has been estimated. Appendix B contains the estimated clean-up cost for the this project. Since numerous permitted facilities exist across North Carolina which are capable of treatment and disposal of fuel oil contaminated soils, a competitive bid solicitation will be issued for excavation and disposal of the 250 tons of soils estimated at the project site. Bid preparation, collection and award shall be conducted in accordance with the work tasks outlined in North Carolina LPUST Non-commercial Trust Fund.

5.1 Project Overview & Total Cost

Subsequent to NCDEM acceptance of the CAP, the soils will be excavated within the boundaries of the impacted areas, transported for disposal, and replaced with clean backfill in the excavation.

As required by the NCDEM, a composite sample will be collected from every 200 cubic yards of remediated soil and submitted for analysis according to Method 5030 and 3550 TPH. The petroleum impacted soils will be remediated to less than 10 ppm according to Method 5030 and 40 ppm according to Method 3550. The assumed maximum depth of excavation will be 20 feet below ground level (bgl) based on data obtained from boring B-2.

Confirmatory samples will be collected for analyses according to Methods 5030 and 3550 TPH from the boundaries of the excavation to verify compliance with specified final clean-up levels.

Based on the proposed cleanup methodology, the scope of work anticipated in our bid solicitation, and the estimated extent of soil contamination, the estimated total cost for soil remediation is calculated in Appendix B. Appendix B also contains the estimated cost for in-situ treatment methodologies which clearly indicate that excavation and disposal is the most cost effective method of site remediation.

5.2 Post Clean Up Monitoring

Following implementation of the CAP, four monitor wells, MW-2 through MW-5, will remain on site. We recommend that these wells be monitored for four quarters after soil remediation to ensure that no 2L groundwater violations exist at the site. We recommend that the site be closed following four consecutive sampling events with no 2L violations.

6.0 LIMITATIONS

This CAP has been prepared for the exclusive use of Melvin Yarborough for specific application to the referenced site located in Guilford County, North Carolina. The Corrective Action Plan was prepared based on the scope of work and level of effort desired by the client and with resources adequate only for that scope of work. The findings have been developed in accordance with generally accepted standards of geology and hydrogeology practices in the State of North Carolina and our professional judgment. No effort has been made to misrepresent the conditions at the site. No other warranty is expressed or implied.

The data presented in this report are indicative of conditions that existed at the precise locations sampled and at the time the sample was collected. Additionally, the data obtained from samples would be interpreted as being meaningful with respect to parameters indicated in the laboratory report. No additional information can logically be inferred from this data.

7.0 REFERENCES

Legacy Environmental Services, Inc., "Initial Site Characterization Report," dated 4, 1994, for Melvin Yarborough Property, Greensboro, North Carolina.

Legacy Environmental Services, Inc., "Comprehensive Site Assessment Report," dated March 10, 1995, for Melvin Yarborough Property, Greensboro, North Carolina.

"An Overview of Underground Storage Tank Remediation Options", U.S. EPA Office of Solid Waste and Emergency Response; Publication # EPA 510-F-93-029; October, 1993.

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Bouwer, H., and Rice, R.C., 1976, A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers With Completely or Partially Penetrating Wells, Water Resources Research, Vol. 12, No. 3.1976.

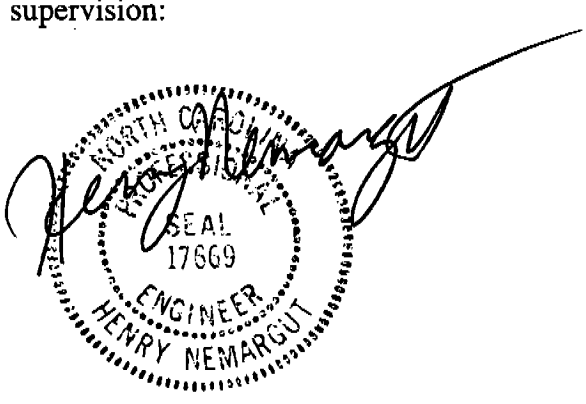
Bouwer, H., 1989, The Bouwer and Rice Slug Test-An Update, Ground Water, Vol. 27, No. 3.

Kruseman, G.P., and deRidder, N.A., 1989, Analysis and Evaluation of Pumping Test Data, International Institute for Land Reclamation and Improvement/ILRI, Wageningen, The Netherlands, 377 p.

Freeze, R.A. & Cherry, J.A., 1979, Groundwater, Prentice Hall, Englewood Cliffs, NJ, 566 p.

8.0 CERTIFICATION

The Corrective Action Plan for this site has been prepared by Legacy Environmental Services, Inc. under the direct supervision of licensed engineers or geologists. Technical review of this document has been provided by Henry Nemargut Engineering Services. All engineering work performed on this project was conducted under my direct supervision:



Henry Nemargut, P.E.
Henry Nemargut Engineering Services
North Carolina License #17669

TABLES

TABLE 1

FIELD AND LABORATORY ANALYTICAL RESULTS
SOIL SAMPLES

2205 OAK HILL DRIVE
GREENSBORO, NORTH CAROLINA

SAMPLE ID	LOCATION	DATE	DEPTH (FT)	TPH (3550)*	TPH (5030)*	OVA **
DN-1	North End UST	2/24/93	8'	103	89.7	N/A
DS-2	South End UST	2/24/93	8'	1,450	145	N/A
B1-8	Boring 1	2/9/95	8'	<40	<10	<10
B1-16	Boring 1	2/9/95	16'	<40	<10	<10
B2-8	Boring 2	2/9/95	8'	120	<10	<10
B2-16	Boring 2	2/9/95	16'	820	<10	56

* Results in parts per million (ppm)

** Field Screening Method (Photoionization Detector) in ppm

N/A = Not Analyzed

<10 and <40 = Below Detection Limits

R95-124A

TABLE 1 (CONT.)

FIELD AND LABORATORY ANALYTICAL RESULTS
SOIL SAMPLES (CONT.)

SAMPLE ID	LOCATION	DATE	DEPTH (FT)	TPH (3550)*	TPH (5030)*	OVA **
B3-8	Boring 3	2/9/95	8'	<40	<10	<10
B3-16	Boring 3	2/9/95	16'	<10	<10	<10
B4-8	Boring 4	2/9/95	8'	<40	<10	<10
B4-16	Boring 4	2/9/95	16'	<40	<10	<10

* Results in parts per million (ppm)

** Field Screening Method (Photoionization Detector) in ppm

N/A = Not Analyzed

<10 and <40 = Below Detection Limits

R95-124A

Table 2A: Soil Remedial Option #1: Ex-situ Land Farming

Ex Situ Bioremediation: Land Farming	
Advantages	• Simple and inexpensive to design, operate, and maintain • Effective on many soil types with a variety of contaminants
Limitations	• Targets only biodegradable constituents • Requires substantial space
System Components	• Nutrients (fertilizer) • Lined treatment cell with berms around the perimeter • Tilling equipment • Lime (needed for low pH) • Irrigation equipment (optional)
Wastestream Treatment	• Might need to treat or dispose of collected rainwater or leachate
Parameters to Monitor[1]	• Soil contaminant concentration • Microbial population in soil • Soil pH, moisture, and nutrients • Leachate analysis (optional)
Cleanup Levels and Timing[2]	• Treats ≥ 90% of biodegradable constituents • For an ideal site[3], ~90% in 6 months to 2 years • For an average site[4], ~90% in 6 months to 3 years • Longer time required to degrade heavier hydrocarbons
Costs[5]	• For an average site[4], $20,000 to $70,000 ($20 to $70/cu yd) • Costs vary with the amount of soil to be treated and the design of the containment cell

[1]"Parameters to monitor" are for performance purposes only; compliance monitoring parameters vary by state.
[2]Cleanup levels are determined by the state.
[3]An "ideal site" assumes no delays in corrective action and a relatively homogeneous, permeable subsurface.
[4]An "average site" assumes minimal delays in corrective action and a moderately heterogeneous and permeable subsurface.
[5]Costs include equipment, and operation and maintenance.

Table 2B: Soil Remedial Option #2: Ex-situ Thermal Desorption

Ex Situ Bioremediation: Biomounding

Advantages	• Degrades semivolatile organic compounds (SVOCs) and nonvolatile organic compounds • Requires low maintenance • Entails a relatively short treatment time • Enhances control and management of aeration, moisture, nutrients, and soil texture • Can use treated soil as backfill
Limitations	• Targets only biodegradable constituents • Must excavate soil and remove debris • Requires sufficient nutrients, moisture, active indigenous microbial population, and pH of 6-9 to degrade contaminants
System Components	• Plastic liner • Gravel and slotted pipe to provide air to mound • Nutrients • Blower • Soil vapor sampling probes • Irrigation system (optional) • Plastic cover (optional) • Vapor treatment equipment (optional)

Wastestream Treatment	• Vapor treatment options (might be needed for high concentrations of contaminants):
	  • *Granulated activated carbon*
	  • *Internal combustion engine*
	  • *Catalytic oxidation unit*
	  • *Thermal incinerator*

Parameters to Monitor[1]	• Vapor concentration • Airflow rate • Soil contaminant concentration • Microbial population • Soil pH, moisture, and nutrients • Leachate analysis (optional)
Cleanup Levels and Timing[2]	• Treats ≥ 90% of biodegradable constituents • For an ideal site[3], ~90% in 6 months to 18 months • For an average site[4], ~90% in 6 months to 2 years • Longer time required to degrade heavier hydrocarbons
Costs[5]	• For an average site[4], $80,000 to $125,000 ($80 to $125/cu yd) • Unit costs generally decrease as soil volume increases

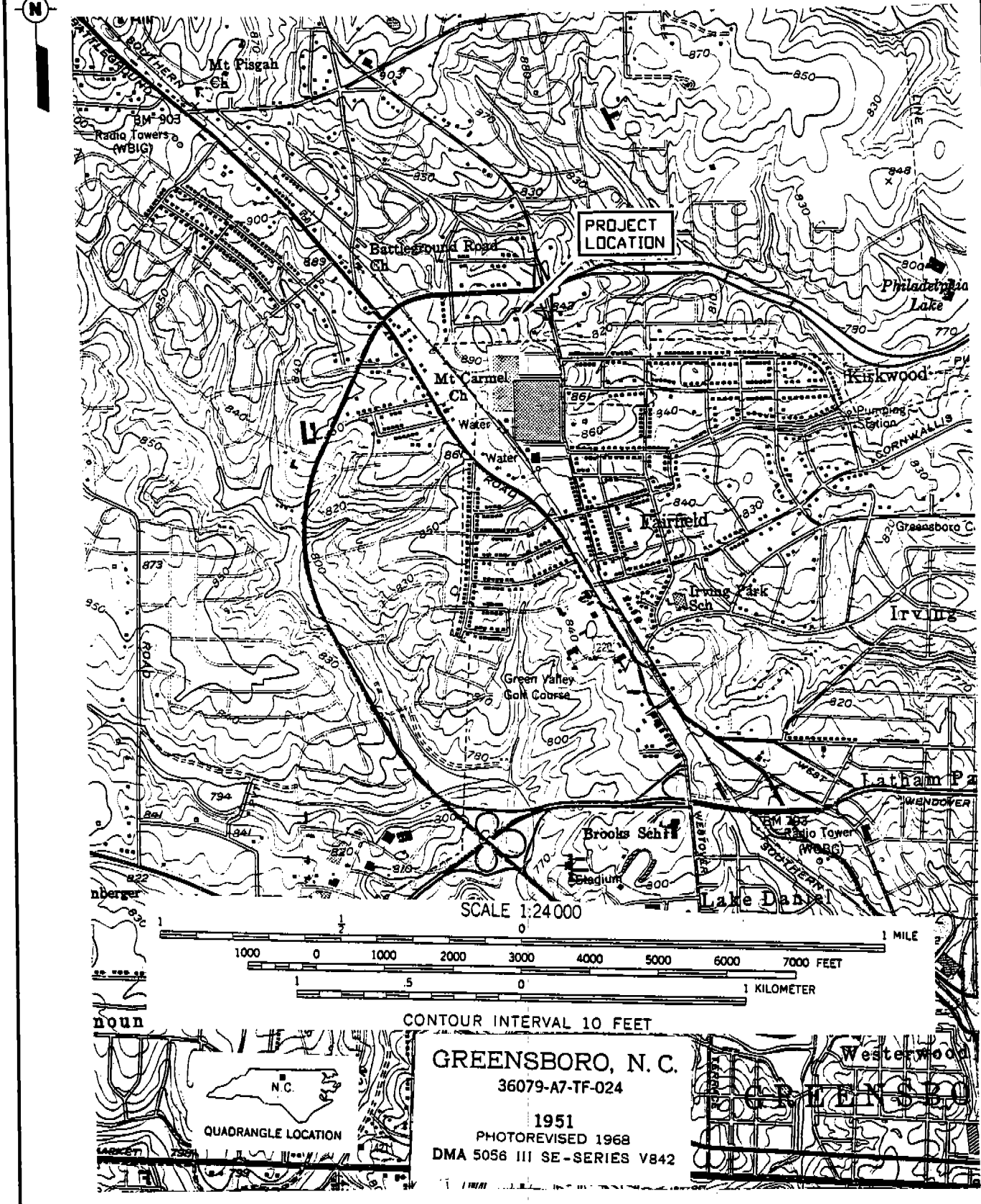
[1]"Parameters to monitor" are for performance purposes only; compliance monitoring parameters vary by state.
[2]Cleanup standards are determined by the state.
[3]An "ideal site" assumes no delays in corrective action and a relatively homogeneous, permeable subsurface.
[4]An "average site" assumes minimal delays in corrective action and a moderately heterogeneous and permeable subsurface.
[5]Costs include equipment, and operation and maintenance.

Table 2C: Soil Remedial Option #3: Ex-situ Biomounding

On-Site Low Temperature Thermal Desorption	
Advantages	• Rapid to implement • Minimizes long-term liability • Can reuse some types of soil for backfill
Limitations	• Expensive for soil with high moisture or clay content • Might require air discharge permits
System Components	• Excavation equipment • Sorting and sizing equipment • Rotary kiln • Offgas treatment equipment
Wastestream Treatment	• Air emissions equipment
Parameters to Monitor[1]	• Contaminant concentrations in pre- and post-treatment soil
Cleanup Levels and Timing[2]	• Can excavate to cleanup standards • >99% removal efficiency • Typically completed in 6 to 8 weeks
Costs[3]	• For an average site[4], $60,000 to $100,000 ($60 to $100/cu yd)

[1] "Parameters to monitor" are for performance purposes only; compliance monitoring parameters vary by state.
[2] Cleanup standards are determined by the state.
[3] Costs include equipment, and operation and maintenance.
[4] An "average site" assumes minimal delays in corrective action and a moderately heterogeneous and permeable subsurface.

FIGURES



LEGACY ENVIRONMENTAL SERVICES, INC.
GREENSBORO, NORTH CAROLINA

CLIENT: MELVIN YARBOROUGH
GREENSBORO, NC

PROJECT: CAP
2205 OAK HILL DRIVE
GREENSBORO, N.C.

TITLE: PROJECT LOCATION
U.S.G.S. TOPO MAP
GREENSBORO QUADRANGLE

SCALE:	1"=2000'
DATE:	8/21/95
DWN.BY:	KBM
DWG.#	L94-181A

FIGURE 1

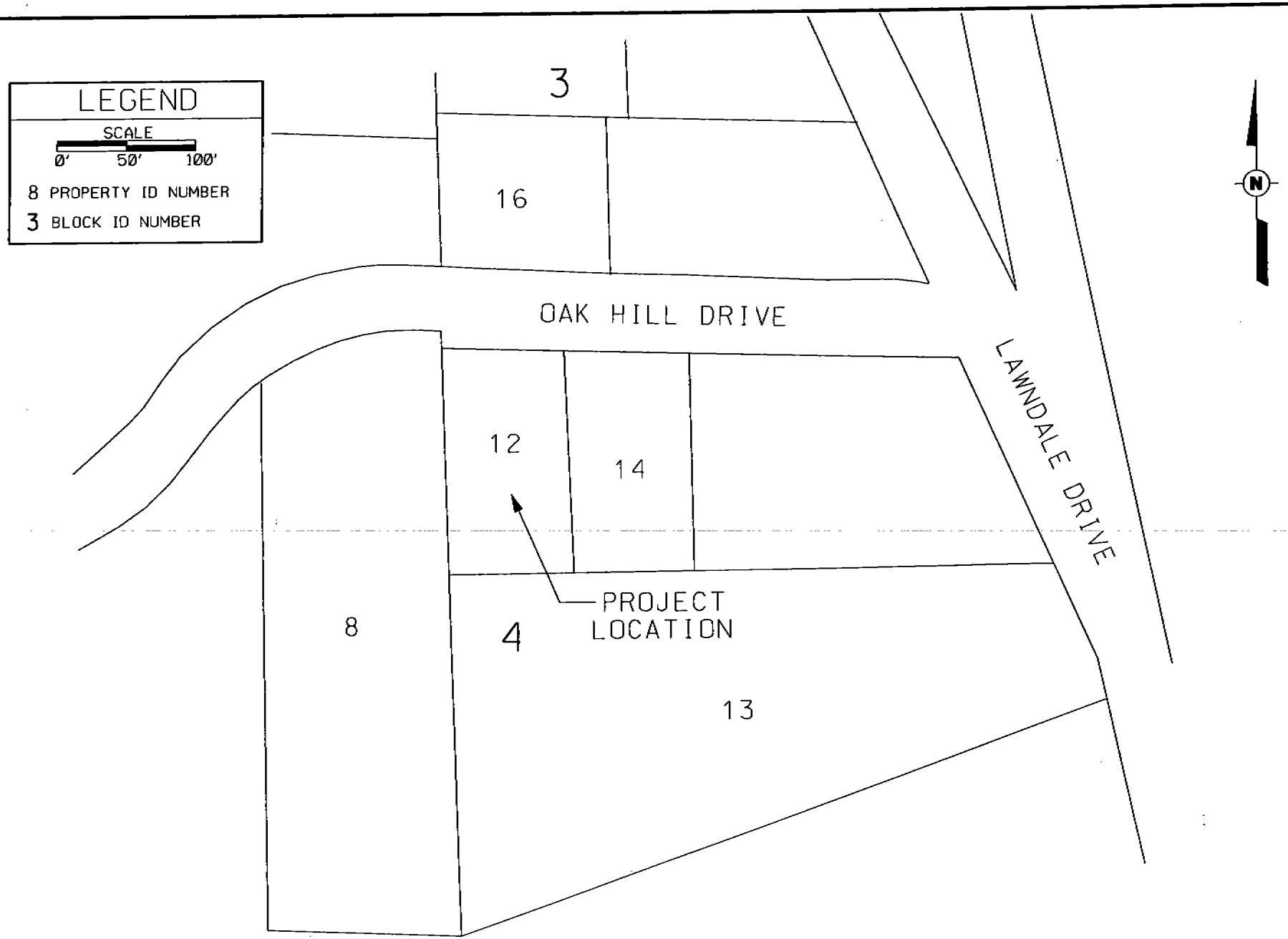
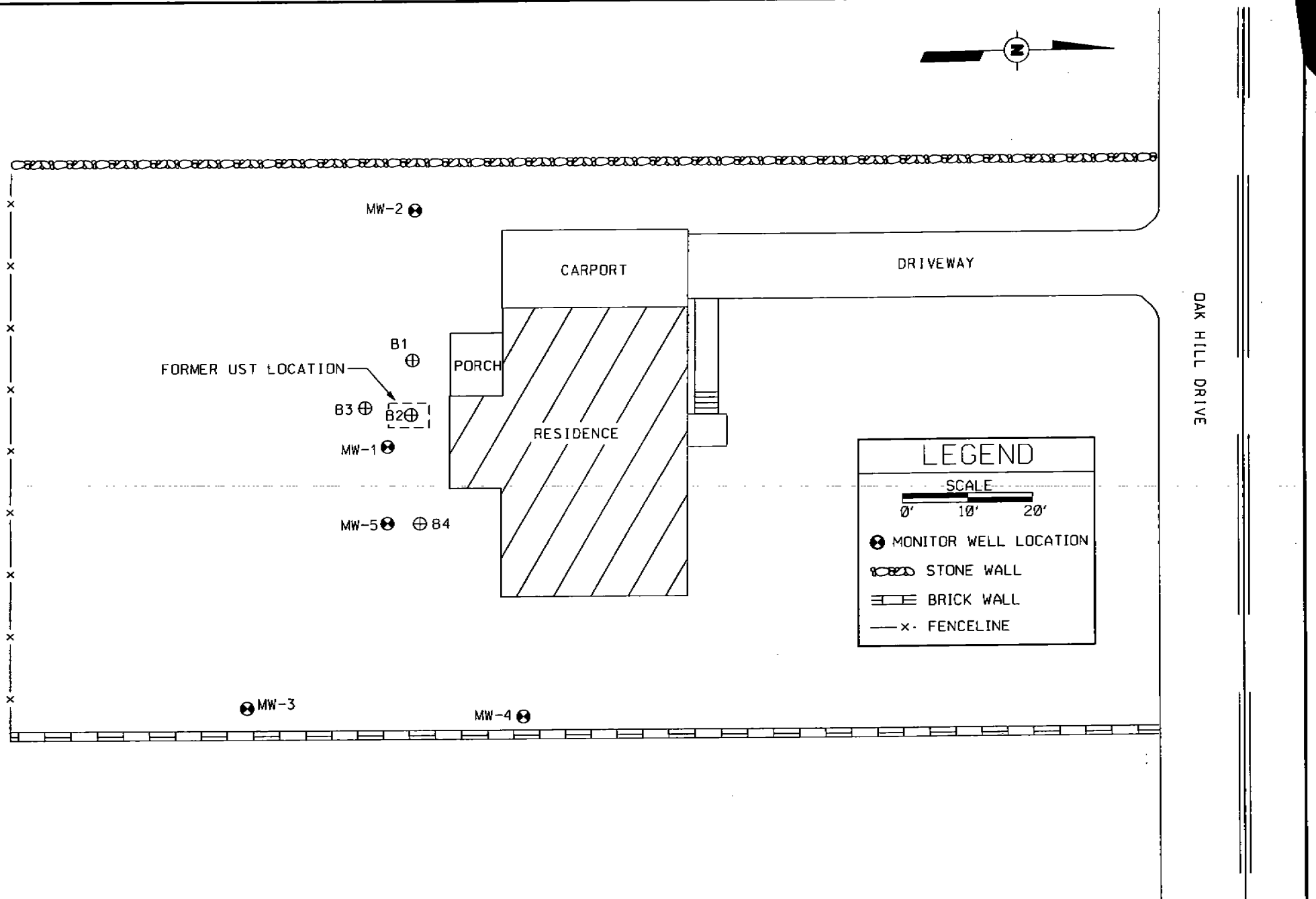


FIGURE 2

SCALE: 1"=100'	TITLE: ADJACENT PROPERTIES MAP	PROJECT: CAP 2205 OAK HILL DRIVE GREENSBORO, NC	CLIENT: MELVIN YARBOROUGH GREENSBORO, NC	LEGACY ENVIRONMENTAL SERVICES, INC. GREENSBORO, NORTH CAROLINA
DATE: 8/21/95				
DWN.BY: KBM				
DWG.# L95-181Z				

FIGURE 3



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DATE: 8/21/95	SITE PLAN	CAP 2205 OAK HILL DRIVE GREENSBORO, N.C.	MELVIN YARBOROUGH GREENSBORO, NC	GREENSBORO, NORTH CAROLINA
DWN.BY: KBM				
DWG.# L95-181				

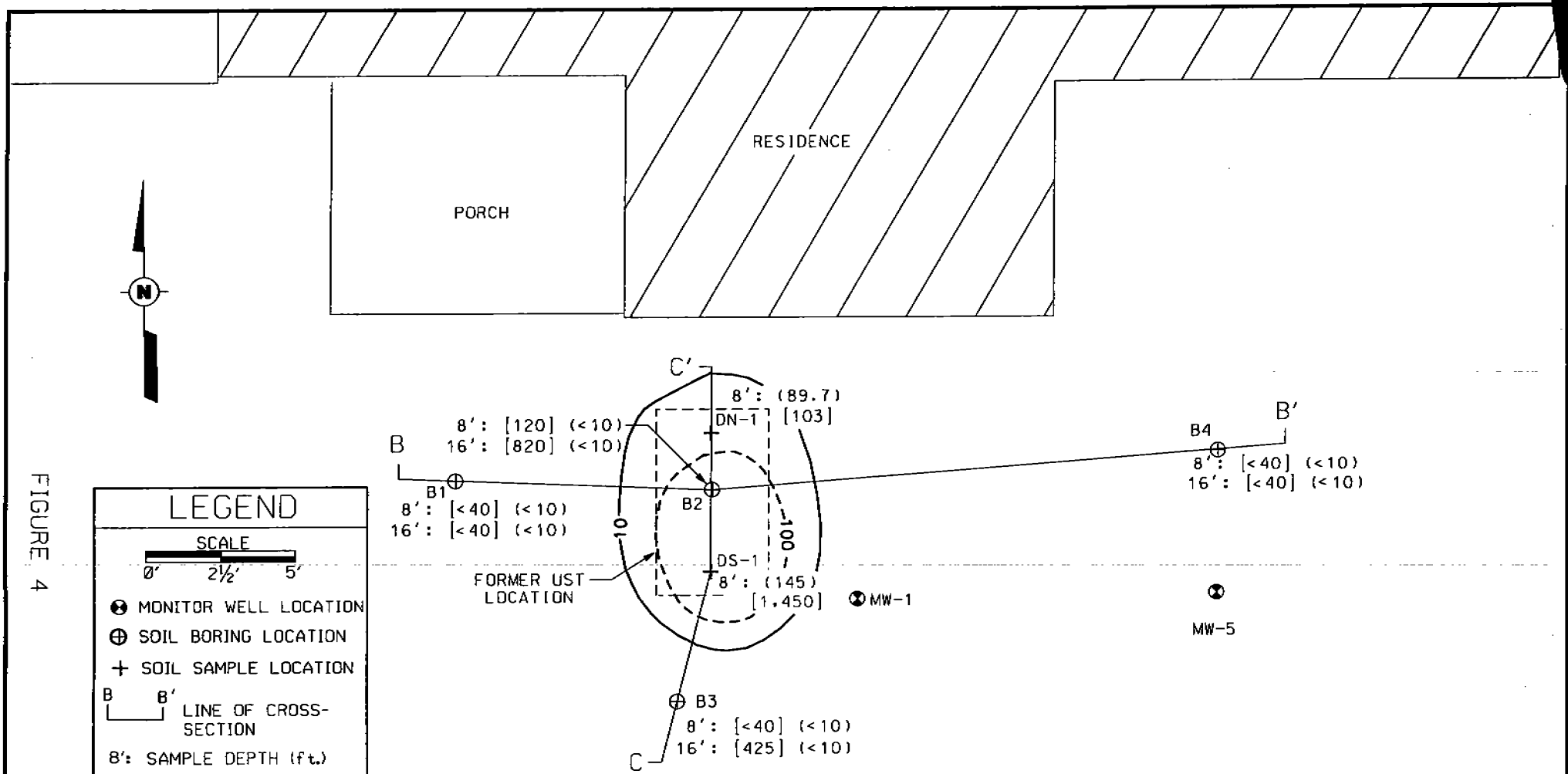


FIGURE 4

LEGEND

SCALE
0' 2½' 5'

- ⊗ MONITOR WELL LOCATION
- ⊕ SOIL BORING LOCATION
- \+ SOIL SAMPLE LOCATION
- B B' LINE OF CROSS-SECTION
- 8': SAMPLE DEPTH (ft.)
- (89.7) TPH BY METHOD 5030 (mg/kg)
- [103] TPH BY METHOD 3550 (mg/kg)
- <10 or <40 TPH NOT DETECTED
- --100-- TPH ISOCONCENTRATION LINE (ppm)
- —10— FINAL CLEANUP LEVEL BY 3550

SCALE: 1"=5'	TITLE: SOIL TPH MAP (WITH 5030 ISOCONS)	PROJECT: CAP 2205 OAK HILL DRIVE GREENSBORO, NC	CLIENT: MELVIN YARBOROUGH GREENSBORO, NC	LEGACY ENVIRONMENTAL SERVICES, INC. GREENSBORO, NORTH CAROLINA
DATE: 8/21/95				
DWN.BY: KBM				
DWG.# L94-181C				

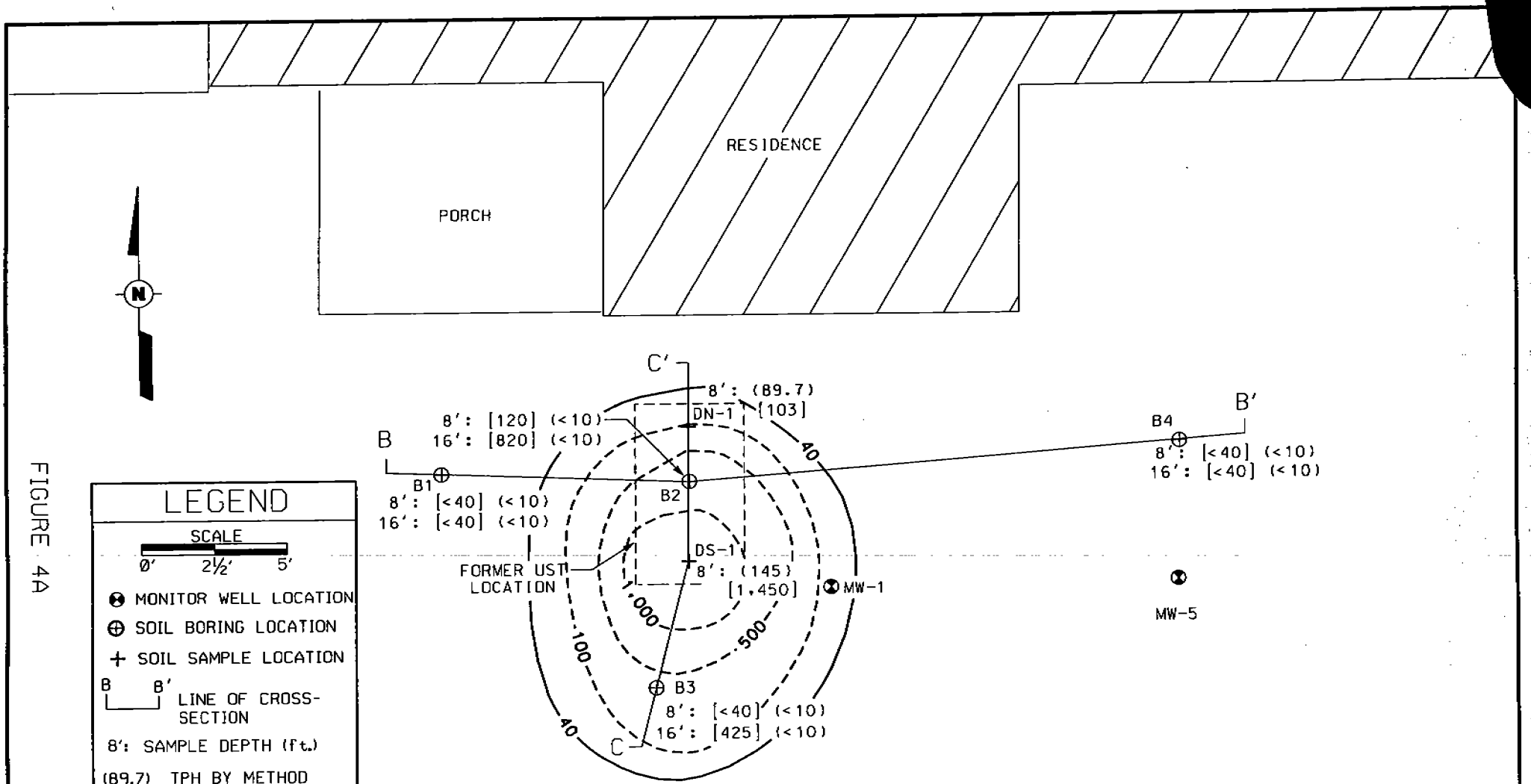


FIGURE 4A

LEGEND

SCALE
0' 2½' 5'

- ⊗ MONITOR WELL LOCATION
- ⊕ SOIL BORING LOCATION
- \+ SOIL SAMPLE LOCATION
- B B' LINE OF CROSS-SECTION
- 8': SAMPLE DEPTH (ft.)
- (89.7) TPH BY METHOD 5030 (mg/kg)
- [103] TPH BY METHOD 3550 (mg/kg)
- <10 or <40 TPH NOT DETECTED
- --100-- TPH ISOCONCENTRATION LINE (ppm)
- —40— FINAL CLEANUP LEVEL BY 3550

SCALE:	1"=5'
DATE:	8/21/95
DWN.BY:	KBM
DWG.#	L94-181B

TITLE: SOIL TPH MAP (WITH 3550 ISOCONS)

PROJECT: CAP
2205 OAK HILL DRIVE
GREENSBORO, NC

CLIENT: MELVIN YARBOROUGH
GREENSBORO, NC

LEGACY ENVIRONMENTAL SERVICES, INC.
GREENSBORO, NORTH CAROLINA

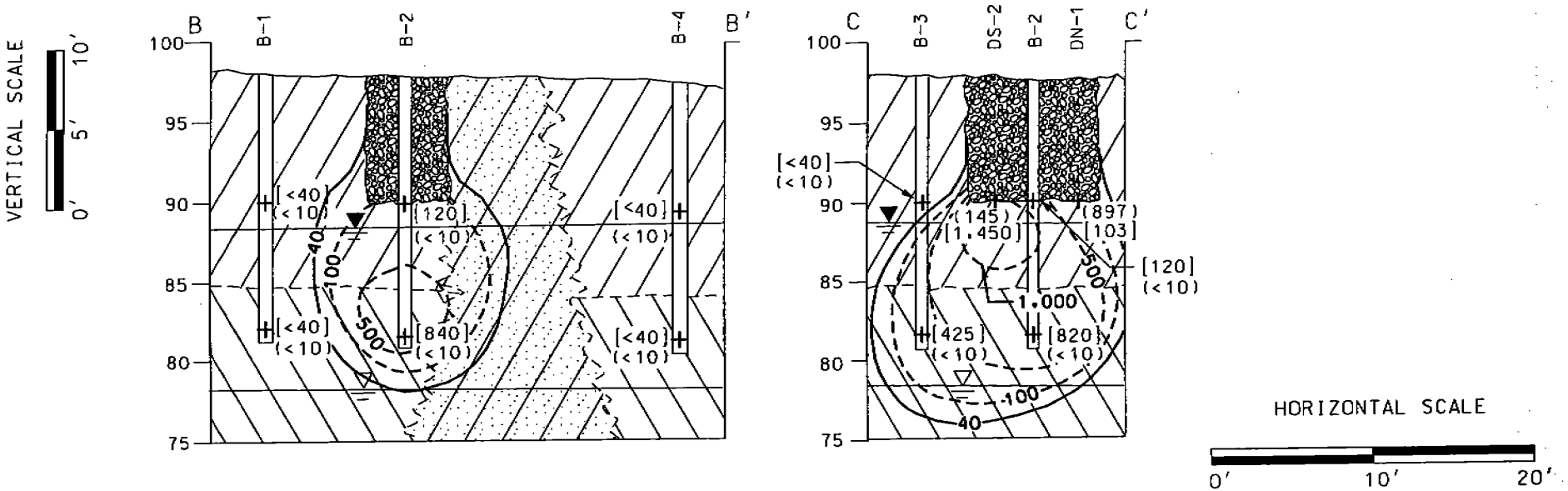


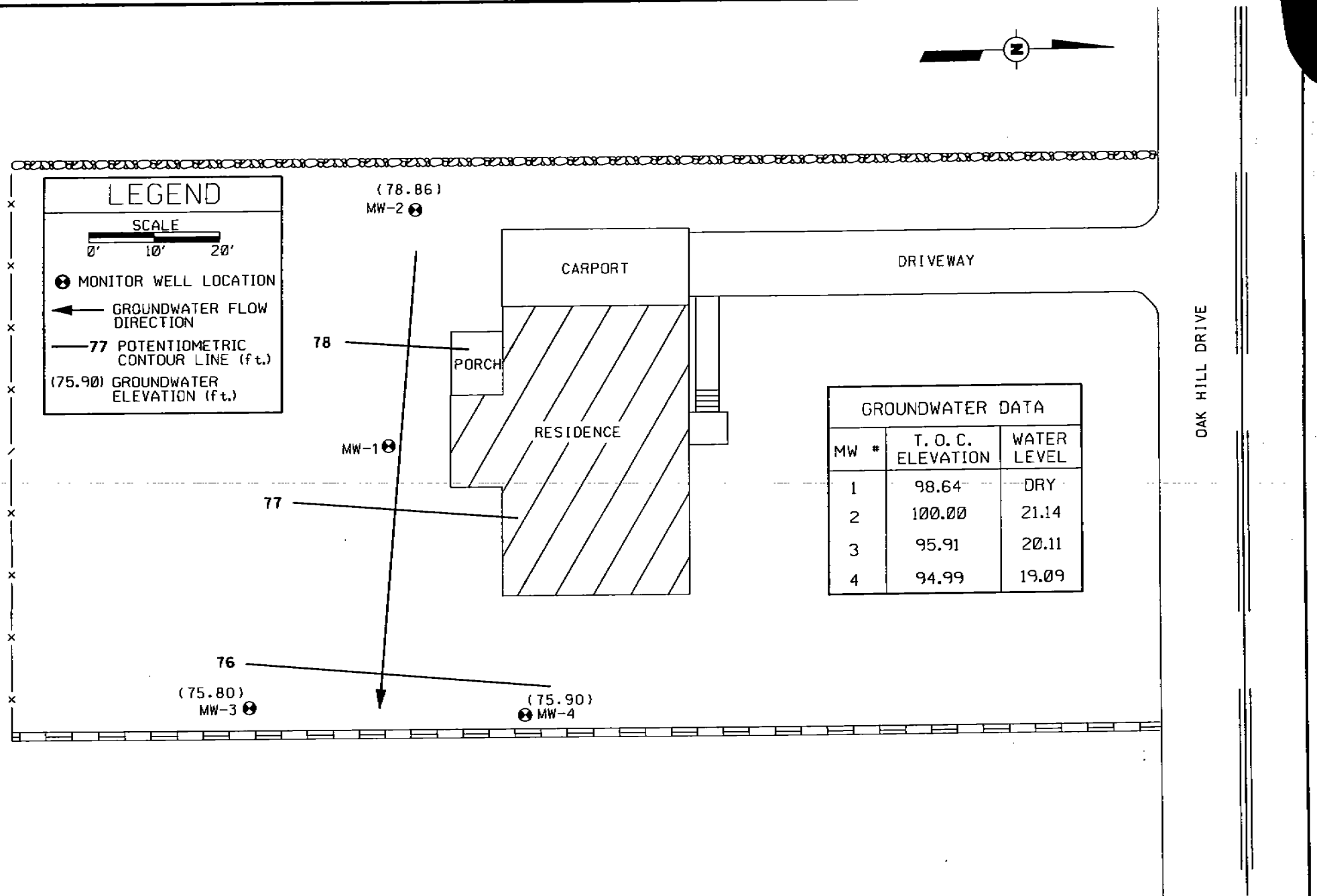
FIGURE 5

LEGEND

- DARK RED TO LIGHT REDDISH-BROWN SILTS WITH VARYING CLAY CONTENT
- RED-BROWN TO TAN-BROWN CLAYS WITH VARYING SILT CONTENT
- BROWN TO RED SILT WITH VARYING CLAY CONTENT AND VARYING AMOUNTS OF FINE AND MEDIUM GRAINED SAND
- BACKFILL
- ----- ZONE OF GRADATIONAL CONTACT
- --100-- TPH ISOCONCENTRATION LINE BY METHOD 3550 (ppm)
- —40— FINAL CLEANUP LEVEL BY METHOD 3550
- ESTIMATED WATER TABLE (AS MEASURED 12-13-94)
- ESTIMATED WATER TABLE (AS MEASURED 2-17-95)
- MONITOR WELL SCREENED INTERVAL
- \+ SOIL SAMPLE LOCATION
- (89.7) TOTAL PETROLEUM HYDROCARBONS (TPH) BY METHOD 5030 (mg/kg)
- [103] TPH BY METHOD 3550 (mg/kg)
- [<40] TPH BY METHOD 3550 NOT DETECTED (mg/kg)

SCALE: 1"=10'	TITLE: SOIL CROSS SECTIONS B TO B' AND C TO C'	PROJECT: CAP 2205 OAK HILL DRIVE GREENSBORO, N.C.	CLIENT: MELVIN YARBOROUGH GREENSBORO, NC	LEGACY ENVIRONMENTAL SERVICES, INC. GREENSBORO, NORTH CAROLINA
DATE: 8/21/95				
DWN.BY: KBM				
DWG.# L95-181D				

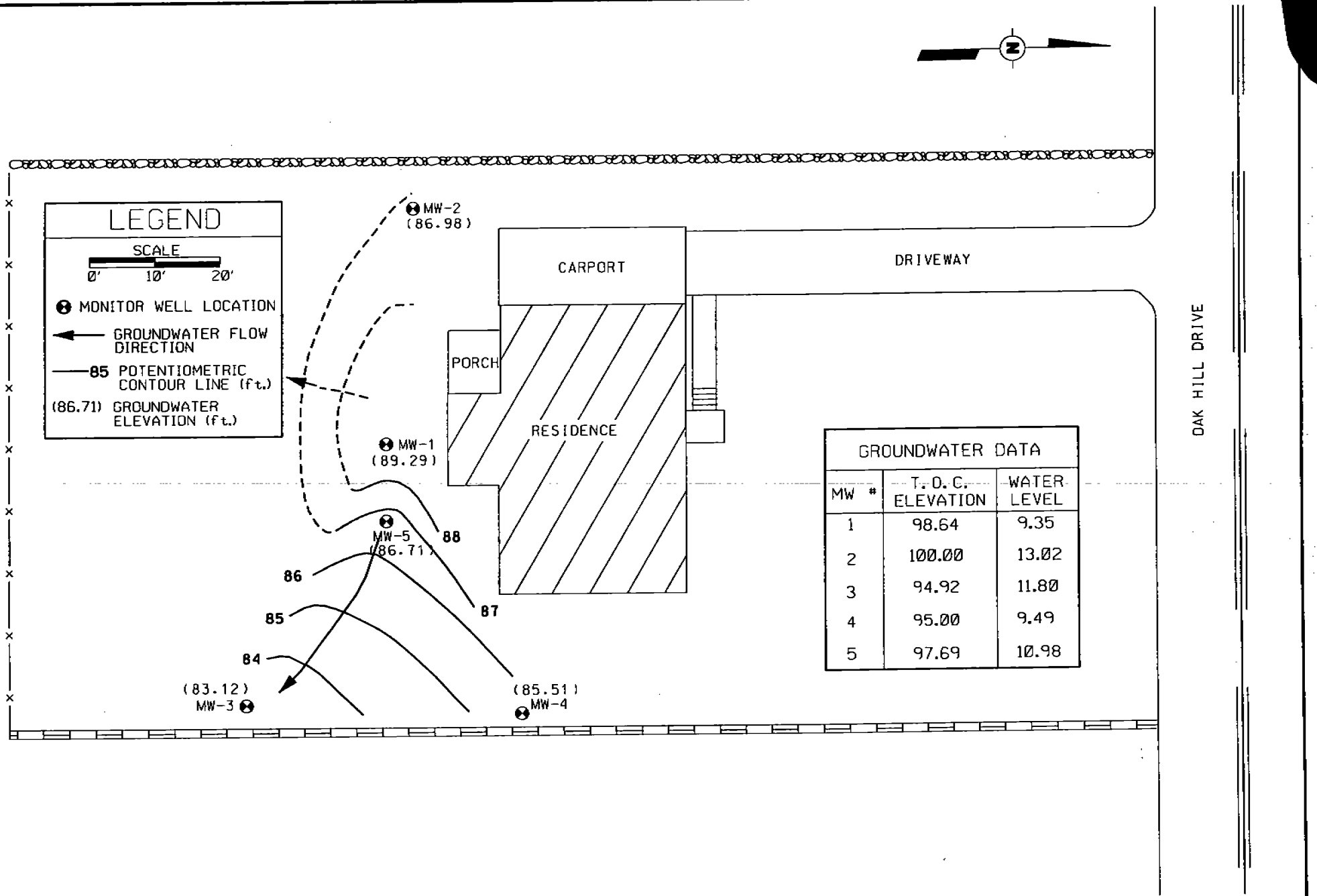
FIGURE 9



GROUNDWATER DATA		
MW #	T. O. C. ELEVATION	WATER LEVEL
1	98.64	DRY
2	100.00	21.14
3	95.91	20.11
4	94.99	19.09

SCALE: 1"=20'	TITLE: POTENTIOMETRIC SURFACE MAP (AS MEASURED 12-13-94)	PROJECT: CAP 2205 OAK HILL DRIVE GREENSBORO, N.C.	CLIENT: MELVIN YARBOROUGH GREENSBORO, NC	LEGACY ENVIRONMENTAL SERVICES, INC. GREENSBORO, NORTH CAROLINA
DATE: 8/21/95				
DWN.BY: KBM				
DWG.# L95-101E				

FIGURE 6A

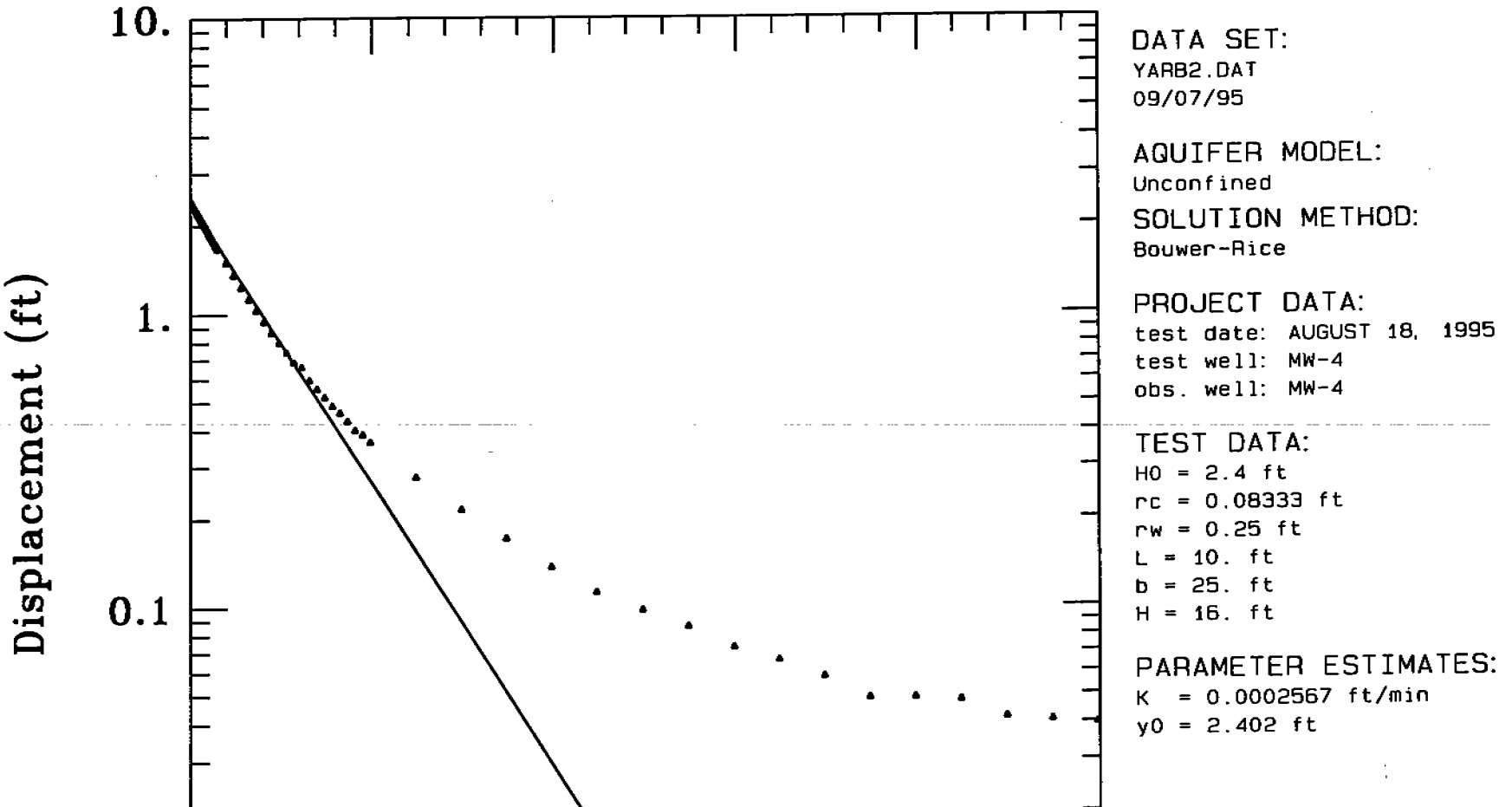


GROUNDWATER DATA		
MW #	T.O.C. ELEVATION	WATER LEVEL
1	98.64	9.35
2	100.00	13.02
3	94.92	11.80
4	95.00	9.49
5	97.69	10.98

SCALE: 1"=20'	TITLE: POTENTIOMETRIC SURFACE MAP (AS MEASURED 2-17-95)	PROJECT: CAP 2205 OAK HILL DRIVE GREENSBORO, N.C.	CLIENT: MELVIN YARBOROUGH GREENSBORO, NC	LEGACY ENVIRONMENTAL SERVICES, INC. GREENSBORO, NORTH CAROLINA
DATE: 8/21/95				
DWN.BY: KBM				
DWG.# L95-181F				

APPENDIX A

SLUG TEST DATA AND ANALYSES



DATA SET:
YARB2.DAT
09/07/95

AQUIFER MODEL:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

PROJECT DATA:
test date: AUGUST 18, 1995
test well: MW-4
obs. well: MW-4

TEST DATA:
H0 = 2.4 ft
rc = 0.08333 ft
rw = 0.25 ft
L = 10. ft
b = 25. ft
H = 16. ft

PARAMETER ESTIMATES:
K = 0.0002567 ft/min
y0 = 2.402 ft

AQTESOLV

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

A Q T E S O L V   R E S U L T S
Version 2.0

Developed by Glenn M. Duffield

09/07/95 10:32:40

==

TEST DESCRIPTION

Data set........... YARB2.DAT
Output file........ YARB.OUT
Data set title..... YARBORO RESIDENCE SLUG TEST
Company............ LEGACY ENVIRONMENTAL
Project............ P-342
Client............. MELVIN YARBORO
Location........... OAK HILL DRIVE, GREENSBORO, NC
Test date.......... AUGUST 18, 1995
Test well.......... MW-4
Obs. well.......... MW-4

Units of Measurement
Length.......... ft
Time............ min

Test Well Data
Initial displacement in well..... 2.4
Radius of well casing........... 0.08333
Radius of wellbore.............. 0.25
Aquifer saturated thickness...... 25
Well screen length.............. 10
Static height of water in well... 16
Gravel pack porosity............ 0
Effective well casing radius..... 0.08333
Effective wellbore radius........ 0.25
Log(Re/Rw)...................... 2.677
Constants A, B and C............ 2.760 , 0.448, 0.000
No. of observations............. 109

==

ANALYTICAL METHOD

Bouwer-Rice (Unconfined Aquifer Slug Test)

==

RESULTS FROM STATISTICAL CURVE MATCHING

STATISTICAL MATCH PARAMETER ESTIMATES

	Estimate		Std. Error	
K =	2.5669E-004	+/-	3.3819E-006	ft/min
y0 =	2.4018E+000	+/-	8.3378E-003	ft

ANALYSIS OF MODEL RESIDUALS

residual = observed - calculated
weighted residual = residual * weight

Weighted Residual Statistics:

Number of residuals	109
Number of estimated parameters	2
Degrees of freedom	107
Residual mean	0.01291
Residual standard deviation	0.04486
Residual variance	0.002012

Model Residuals:

Time	Observed	Calculated	Residual	Weight
0.017	2.406	2.3906	0.015417	1
0.033	2.425	2.38	0.044959	1
0.05	2.414	2.3689	0.045108	1
0.067	2.405	2.3578	0.047205	1
0.083	2.391	2.3474	0.043601	1
0.1	2.382	2.3364	0.045598	1
0.117	2.365	2.3255	0.039542	1
0.133	2.344	2.3152	0.028797	1
0.15	2.338	2.3044	0.033642	1
0.167	2.325	2.2936	0.031437	1
0.183	2.313	2.2834	0.02955	1
0.2	2.305	2.2728	0.032247	1
0.217	2.293	2.2621	0.030893	1
0.233	2.278	2.2521	0.025868	1
0.25	2.269	2.2416	0.027418	1
0.267	2.257	2.2311	0.025919	1
0.283	2.241	2.2212	0.019756	1
0.3	2.232	2.2108	0.021162	1
0.317	2.217	2.2005	0.016518	1
0.333	2.208	2.1908	0.017221	1
0.35	2.201	2.1805	0.020484	1
0.367	2.186	2.1703	0.015698	1
0.383	2.177	2.1607	0.016268	1
0.4	2.163	2.1506	0.01239	1
0.417	2.155	2.1405	0.014464	1
0.433	2.141	2.1311	0.0099031	1
0.45	2.131	2.1211	0.0098861	1
0.467	2.112	2.1112	0.00082232	1
0.483	2.11	2.1019	0.0081315	1
0.5	2.102	2.092	0.0099776	1
0.517	2.083	2.0822	0.00077755	1
0.533	2.076	2.073	0.0029591	1
0.55	2.067	2.0633	0.0036701	1
0.567	2.051	2.0537	-0.0026643	1
0.583	2.042	2.0446	-0.0026087	1
0.6	2.031	2.035	-0.0040309	1
0.617	2.021	2.0255	-0.0044979	1
0.633	2.019	2.0166	0.0024335	1
0.65	2.004	2.0071	-0.00312	1
0.667	1.992	1.9977	-0.0057178	1
0.683	1.982	1.9889	-0.0069089	1
0.7	1.974	1.9796	-0.005592	1
0.717	1.966	1.9703	-0.0043187	1

0.733	1.948	1.9616	-0.013631	1
0.75	1.939	1.9524	-0.013441	1
0.767	1.929	1.9433	-0.014295	1
0.783	1.925	1.9347	-0.0097264	1
0.8	1.911	1.9257	-0.014663	1
0.817	1.898	1.9166	-0.018643	1
0.833	1.885	1.9082	-0.023191	1
0.85	1.867	1.8993	-0.032252	1
0.867	1.867	1.8904	-0.023356	1
0.883	1.857	1.882	-0.02502	1
0.9	1.848	1.8732	-0.025204	1
0.917	1.842	1.8644	-0.022429	1
0.933	1.83	1.8562	-0.026208	1
0.95	1.819	1.8475	-0.028512	1
0.967	1.81	1.8389	-0.028858	1
0.983	1.8	1.8307	-0.030749	1
1	1.791	1.8222	-0.031173	1
1.017	1.783	1.8136	-0.030638	1
1.033	1.773	1.8056	-0.03264	1
1.05	1.764	1.7972	-0.033182	1
1.067	1.754	1.7888	-0.034763	1
1.083	1.746	1.7809	-0.034876	1
1.1	1.737	1.7725	-0.035533	1
1.117	1.73	1.7642	-0.03423	1
1.133	1.723	1.7565	-0.033451	1
1.15	1.711	1.7482	-0.037223	1
1.167	1.703	1.74	-0.037033	1
1.183	1.693	1.7324	-0.03936	1
1.2	1.676	1.7242	-0.048245	1
1.217	1.678	1.7162	-0.038168	1
1.567	1.507	1.558	-0.051031	1
1.9	1.367	1.4211	-0.054123	1
2.233	1.243	1.2962	-0.053246	1
2.567	1.135	1.182	-0.047015	1
2.9	1.038	1.0781	-0.040148	1
3.233	0.95	0.98341	-0.033409	1
3.567	0.873	0.89675	-0.023747	1
3.9	0.807	0.81795	-0.010947	1
4.233	0.747	0.74607	0.00092773	1
4.567	0.689	0.68033	0.0086749	1
4.9	0.666	0.62054	0.045457	1
5.233	0.6	0.56601	0.033985	1
5.567	0.56	0.51613	0.043865	1
5.9	0.524	0.47078	0.053219	1
6.233	0.489	0.42941	0.059588	1
6.567	0.463	0.39157	0.071429	1
6.9	0.433	0.35716	0.075838	1
7.232	0.404	0.32587	0.078132	1
7.562	0.39	0.29748	0.092521	1
7.902	0.368	0.27081	0.097185	1
9.902	0.278	0.15587	0.12213	1
11.902	0.216	0.089714	0.12629	1
13.902	0.173	0.051636	0.12136	1
15.902	0.138	0.02972	0.10828	1
17.902	0.113	0.017106	0.095894	1
19.902	0.098	0.0098454	0.088155	1
21.902	0.086	0.0056667	0.080333	1
23.902	0.073	0.0032615	0.069738	1
25.902	0.066	0.0018772	0.064123	1
27.902	0.058	0.0010805	0.05692	1

29.902	0.049	0.00062187	0.048378	1
31.902	0.049	0.00035793	0.048642	1
33.902	0.048	0.00020601	0.047794	1
35.902	0.042	0.00011857	0.041881	1
37.902	0.041	6.8246E-005	0.040932	1
39.902	0.04	3.928E-005	0.039961	1

RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

	Estimate
K =	2.5669E-004 ft/min
y0 =	2.4018E+000 ft

APPENDIX B

SOIL REMEDIATION
COST ESTIMATE

ESTIMATED COST FOR REMEDIATION BY SOIL EXCAVATION

DESCRIPTION	ESTIMATED # OF UNITS	UNIT COST	TOTAL
Health & Safety Plan	1	$500	$ 500.00
Excavation Work Plan	1	$850	$ 850.00
Soil Disposal Plan	1	$900	$ 900.00
Field Supervision	2	$600/day	$ 1,200.00
Soil Analyses (5030/3550)	10	$126.50/sample	$1,265.00
Consultant Travel	80	$1.75/mile	$140.00
Site Closure Report	1	$2,200	$2,200.00
Soil Excavation (Est.)	250 tons	$9.00/ton	$2,250.00
Contractor Mobe (Est.)	1	$500.00	$500.00
Backfill & Placement(Est.)	250 tons	$12.00/ton	$3,000.00
Load, Haul, Disp (Est.)	250 tons	$27.00/ton	$6,750.00
Site Restoration	1	$500.00	$500.00
	ESTIMATED TOTAL		**$20,055.00**

The estimated cost for in-situ methods for comparative purposes is summarized below:

OPTION #1 - REMEDIATION BY SOIL VAPOR EXTRACTION

DESCRIPTION	ESTIMATED # OF UNITS	UNIT COST	TOTAL
Feasibility Testing	1	$3,575.00	$ 3,575.00
Design, Specify, Bid an SVE system	1	$2,875.00	$2,875.00
Install vapor wells (20' deep)	2	$1,200.00	$2,400.00
SVE System	1	$4,000.00	$4,000.00
System Installation	1	$2,000.00	$2,000.00
System Startup	1	$2,200.00	$2,200.00
Quarterly Monitoring & Report	8	$1,500	$12,000.00
Site Closure Report	1	$2,200	$2,200.00
	ESTIMATED TOTAL		**$31,250.00**

OPTION #2 - REMEDIATION BY SOIL BIO-VENTING

DESCRIPTION	ESTIMATED # OF UNITS	UNIT COST	TOTAL
Bio-Feasibility Testing	1	$5,000.00	$ 5,000.00
Design, Specify, Bid a Bio-venting system	1	$2,875.00	$2,875.00
Install vapor wells (20' deep)	2	$1,200.00	$2,400.00
Bio-venting System	1	$2,000.00	$2,000.00
System Installation	1	$2,000.00	$2,000.00
System Startup	1	$2,200.00	$2,200.00
Quarterly Monitoring & Report	12	$1,500	$18,000.00
	ESTIMATED TOTAL		**$34,475.00**

NOTE: Where possible, unit costs are based on proposed NC LPUST Trust Fund task rates.

Costs for post clean up monitoring will be estimated following CAP approval and monitoring requirements set forth by the NCDEHNR.